

**FLOWERING AND FLOWER MORPHOLOGY OF PLANTS IN
THE DRY - EVERGREEN FOREST
AT SAKAERAT ENVIRONMENTAL RESEARCH STATION,
THAILAND**

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บทคัดย่อ

การศึกษาการออกดอกและลักษณะของดอกของพืชในป่าดิบแล้ง บริเวณสถานีวิจัยสิ่งแวดล้อมสะแกกราช อ.ป่าทองจ. นครราชสีมา ได้ดำเนินการในแปลงถาวรขนาด 1 ตารางกิโลเมตร (1x1 กิโลเมตร) โดยการดำเนินสำรวจเป็นแนวยาว 1 กิโลเมตร จำนวน 10 แนว โดยที่แต่ละแนวห่างกัน 100 เมตร ทำการบันทึกจำนวนชนิดพันธุ์ไม้ที่ออกดอกในทุกชั้นเรือนยอด พร้อมทั้งเก็บตัวอย่างดอกมาดองใน 70% แอลกอฮอล์เพื่อนำไปศึกษาลักษณะทางสัณฐานวิทยาของดอกต่อไป ผลการศึกษาปรากฏว่าพันธุ์ไม้จำนวน 149 ชนิดจากจำนวนชนิดที่ปรากฏในแปลงประมาณ 200 ชนิด ออกดอกในช่วง 1 ปี ที่ทำการศึกษา ในช่วงเดือนกุมภาพันธ์ถึงเมษายน มีจำนวนชนิดที่ออกดอกมากที่สุด ซึ่งเป็นช่วงระยะเวลาที่อุณหภูมิเฉลี่ยต่ำสุดกำลังสูงขึ้นและเริ่มมีฝนตก แต่ในระหว่างเดือนพฤศจิกายนและธันวาคม เป็นช่วงที่มีชนิดพันธุ์ไม้ที่ออกดอกน้อยที่สุด ไม้พุ่ม (shrub) และไม้เถา (climber) มีจำนวนชนิดที่ออกดอกมากที่สุด แต่พันธุ์ไม้เรือนยอดชั้นบนออกดอกเพียง 12 ชนิด หรือเพียง 8% ของจำนวนชนิดที่ออกดอกทั้งหมด พันธุ์ไม้ที่ออกดอกส่วนใหญ่มีลักษณะของดอกดังนี้ กลีบเลี้ยงเชื่อมติดเป็นหลอดปลารากลิ้นแฉก กลีบดอกแยก ยอดเกสรตัวเมียกลม ยอดเกสรตัวเมียมียูกู้ต่ำกว่าระดับของหลอด รังไข่อยู่เหนือส่วนอื่นของดอก (superior ovary) เมล็ดซ้อน (ovule) เรียงตัวแบบ axile placentation การออกดอกและลักษณะของดอกที่ปรากฏดังกล่าวสามารถเป็นตัวบ่งชี้ชนิดและลักษณะของสัตว์ผสมพันธุ์ได้

ABSTRACT

The research on flowering and flower morphology of plants in the dry - evergreen forest was carried out at Sakaerat Environmental Research Station, Amploe Pak Thong - Chai, Nakorn - Rachasima Province. The data were obtained from a 1 square kilometer permanent plot. Ten sampling stripes, 1 kilometer long and 100 meters apart were made to be surveying lines. All species flowered at that time were recorded along the sampling stripes and the flowers were collected and preserved in 70% ethanol for further investigation on flower characteristics.

It was found that 149 species out of 200 species giving flowers in 1 year period. A large number of species produced flowers during February and April when temperature was rising up from low temperature in the winter and rain has just started. In the winter, during November and December, smaller number of plants have given flowers. More than 50% of flowering plant species observed here belonged to shrub and climber. But only 12 species of the upper layer or 8% of the total species observed presented flowers. The flowers produced mostly have the following flower morphology : tubular calyx with separated lobes, separated perals, rounded stigma, strigas under anthers, superior ovary and axile placentation. These flower morphological characteristics could be used to indicate the types and characteristics of pollinators.

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INTRODUCTION

The dry evergreen forest is one of the main forest types in Thailand. Whitmore (1984) referred to it as a tropical semi-evergreen rain forest. This type of forest is scattered all over the country along the depressions on the peneplain and along the valleys of low hill ranges of about 500 m. elevation. Usually, this forest type is comprised of dense vegetation with four verticle layers. Almost all the tree species of the upper layers are among the most economic species of the country.

Eventhough the sapling and seedling layers of this forest formation are dense, most of the plants belong to the species of the understorey and shrubs, not trees. This might have an effect on any stage of their reproductive processes. Flowering is an important function of vegetation regeneration and needs to be closely studied. There is no report on the flowering of this forest type except one paper on phenology (Dhamanitayakul, 1976). A study of flower morphology is expected to bring us to understand the reproductive mechanism, for instance, compatibility patterns and pollination mechanism of the vegetation.

Sakaerat Environmental Reserch Station is the only natural terrestrial forest research station in Thailand. Dry - Evergreen Forest is the main forest type, covering about 36.7 % (30 km²) of the total area of the station, and is comprised of more than 200 phant species (Smitinand et al, 1968).

METHODS OF STUDY

Ten surveying lines, 100 meters apart, were laid within one squire kilometer of the

undisturbed Dry - Evergreen Forest. All species giving flowers were recorded every month from February 1986 to January 1987. The flowers were collected and preserved in 70 % alcohol. Some flower morphological features were studied using either a hand-lens or microscope.

RESULTS AND DISCUSSION

There were 149 plant species out of the total of 200 species which produced flowers in the one-year period (Table 1). Among them only 8.05 % of the species producing flowers belonged to the upper tree layer, while shrubs and climbers shared the greatest number of species, up to 28.86 %. The upper tree layer, moreover, showed seasonsl flowering, with the flowering period confined to February and April. While the shrub layer, the ground layer and the climbers produced flowers all year long. However, a small number of species produced flowers during July - August and November-January (Table 1, Fig. 1).

Low temperature and the first rain seem to be the important factors induced flowering in the plants of the dry - evergreen forest. About 45 % of the species studies produced flowers from February to April when the minimum temperature just risen up from about 13° c on January and the rain was just started on February (Fig. 2). After this period, the smaller number of species produced flowers when the average minimum temperature higher than 15° c. However the amount of rain fall seem to relate to the initiation of the flowers especially the flowering of shrubs and climbers.

Types of flowers could be classified using the morphology of the flowers. Basing on calyx and corolla, the flowers could be distinguished

Table 1. Flowering of plants growing in the dry - evergreen forest at Sakaerat Environmental Research Station, Thailand.

Months	No. of Plant Species Produced Flowers in each Plant Layers						Total (%)
	Upper layer	Lower layer	Shrub layer	Ground layre	Climbers	Epiphytes	
Feb. 1986	2	3	9	3	5	1	23 (15.44)
Mar.	5	6	3	4	2	-	20 (13.42)
Apr.	3	7	7	2	3	-	22 (14.77)
May.	no observation						-
Jun.	1	5	5	2	5	-	18 (12.08)
Jul.	1	4	-	-	4	-	9 (6.04)
Aug.	-	2	-	5	1	-	8 (5.57)
Sep.	-	-	6	-	6	-	12 (8.05)
Oct.	-	-	3	2	7	-	12 (8.05)
Nov.	-	1	2	1	2	-	6 (4.03)
Dec.	-	1	3	-	3	-	7 (4.70)
Jan. 1987	-	4	3	-	5	-	12 (8.05)
Total (%)	12 (8.05)	33 (22.15)	41 (27.52)	19 (12.75)	43 (28.86)	1 (0.67)	149 (100)

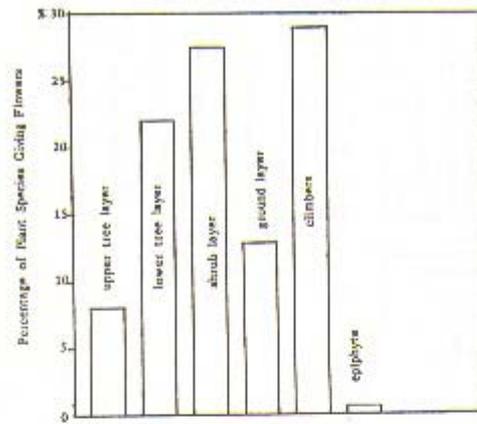


Figure 1. Percentage of Plant species giving flowers in the dry-evergreen forest.

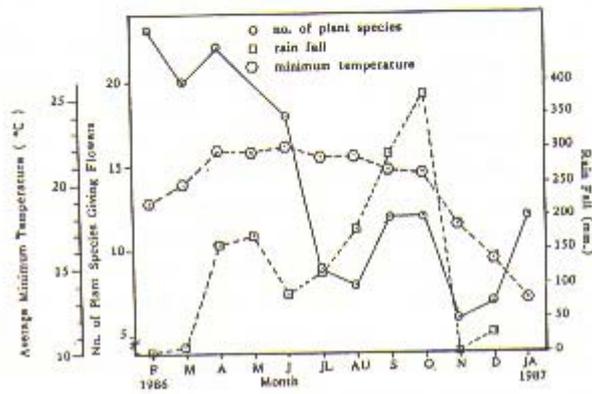


Figure 2. Variation of the number of plant species giving flowers in one year period.

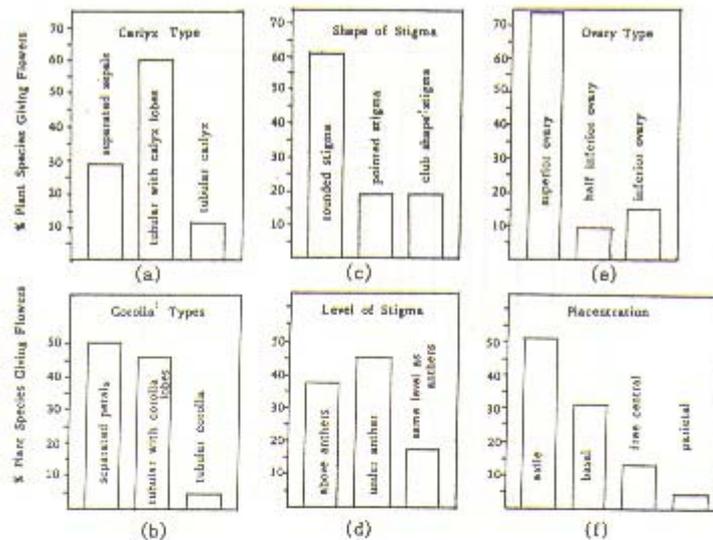


Figure 3. Morphological characteristics of flowers found in the dry-evergreen forest at Sakaerat Experimental Research Station.

as tubular, tubular with separated lobes and separated perianths. The flower having tubular with separated calyx lobes was the dominant type (Fig. 3 a), while concerning with corollas the tubular corolla with separated lobes and the separated petals were the characteristics of most flowers and occurred at the same frequency (Fig. 3 b). When using the level of the stigmas comparing to the anthers as a criteria, the flowers could be classified into 3 types: the flower with stigmas below anthers (45%), the flower with stigmas above anthers (37.5%) and the flower with stigmas at the same level as anthers (17.5%) (Fig. 3d). The shape of the stigmas of the most species were round (61.29%), while the remain species were either pointed or club-shaped stigmas and found at the same percentage (19.35%) (Fig. 3c). The

species producing flowers with superior ovaries were the most dominant type (74.51%), while those with an inferior ovary and half-inferior ovary shared a much lower percentage, 15.69% and 9.80% respectively (Fig. 3e). The species having flower of axile placentation presented the greatest percentage which was greater than 50% while the species with the flower of parietal placentation found the least, less than 5% (Fig. 3f). These morphological features of the flowers can be related to the pollinator types which are useful to estimate the competition of the pollinators in the forest communities.

CONCLUSION

There were about 75%, 149 out of 200, of plant species produced flowers during February, 1986 to January, 1987. Most of the

species produced flowers belonged to the shrub layer and climber, but only 8 % of the flowering species belong to the upper layer species. The large number of those species produced flowers during February and April when at this period the average minimum temperature was rising up and the rain just started. Most of the flowers produced have the following characteristics, tubular calyx with separated lobes, separated petals, round stigma, stigmas under anthers, superior ovary and axile placentation.

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REFERENCES

- Dhamanitayakul, P. 1979. The phenogy of trees in dry evergreen forest and its application to timing for logging operation. For. Res. Bull. No. 64. Faculty of Forestry, Kasetsart University.
- Smitinand, T., C. Chaiyanand, and T. Santisok 1968. Inventory of vegetation in one hectare (100 m x 100 m plot) centered on forest tower, ASRCT Sakaerat Experiment Station, Report No. 3, ASRCT, Bangkok. 13 p.
- Whitmore, T.C. 1984. Tropical rain forest of the Far East. Second Edition. Clarendon Press, Oxford.